Hydrolysed brewery yeast for dairy cows

by Juhani Vuorenmaa, Suomen Rehu Oy, Upseerinkatu 1, PO Box 401, FI-02601 Espoo, Finland.

Dietary supplements of yeast have been reported to improve milk production and feed efficiency in dairy cows. Improvements in performance are attributed mainly to increased numbers of rumen bacteria and changes in rumen VFA.

However, the animal responses have not been consistent. Stage of lactation or differences in basic feeds may have affected the responses as well as the dose, type and quality of the yeast. Despite the stated production responses, the specific mode of action of yeast in the rumen is still unclear.

The most common yeast products fed to ruminants are live cells. However, for example Oezturk et al 2005 demonstrated that the addition of live and autoclaved (inactivated) Saccharomyces boulardii yeast both stimulated microbial metabolism with no major differences between the live and dead form. In trials carried out with hydrolysed, inactivated brewery yeast (Progut) the product was shown to significantly enhance rumen fermentation through increased microbial biomass and VFA production.

In performance trials with dairy cows it was seen to improve milk production and feed efficiency.

Increased energy

Rumen fermentation converts feed raw material into microbial protein and to volatile fatty acids that are the cow's main energy source. Therefore, an increase in microbial numbers and fermentation after feeding means more protein and energy for the cow.

Quicker fermentation also means better degradation of feed material in the rumen which enables higher feed intake to support high volumes of milk production. In rumen simulation studies, carried out by Alimetrics Ltd in Finland, Progut increased both the production of protein and energy by increasing the number of rumen microbes and by increasing short chain fatty acid production during the simulation process (see Fig. 1).

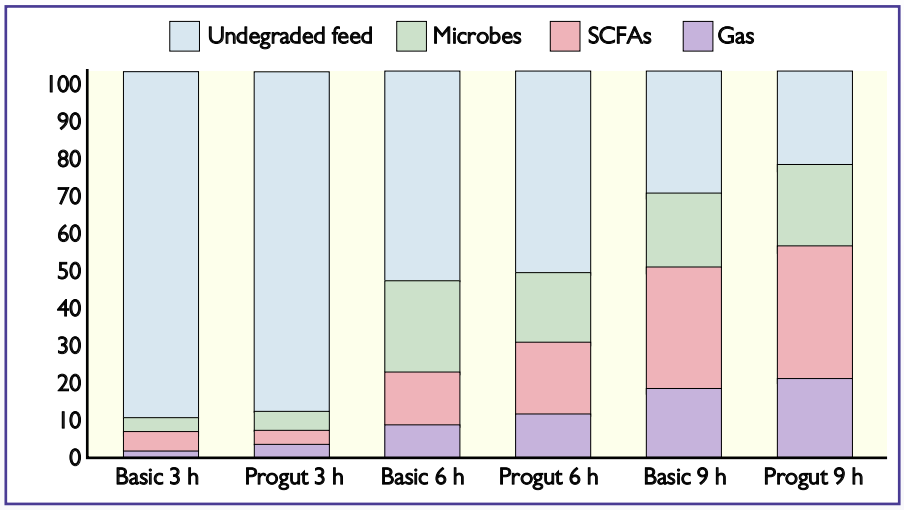

Fig. 1. The effect of Progut on rumen fermentation parameters (Alimetrics Ltd).

The amount of undegraded feed decreased with the addition of Progut. The studies were done with a batch simulation and the silage-concentrate ratio was 50:50.

The hydrolysed brewery yeast enhanced rumen fermentation with both Scandinavian type grass silage diets and with European type maize silage diet.

The effects of Progut were also compared

Continued on page 20

Table 1. The effects of different yeast products on the rumen fermentation parameters in vitro (Alimetrics Ltd 2006).

	Progut	Live yeast product	Yeast culture mixture
Fermentation rate 0-6 hours	Significant increase by >10% p-value < 0.0001	Significant increase by > 10% 0.001 > p-value > 0.0001	NS
Total SCFA	Significant increase by >10% 0.01 > p-value > 0.001	Significant increase by 5-10% 0.05 > p-value > 0.01	NS
Acetic acid	Significant increase by 5-10% 0.01 > p-value > 0.001	NS	NS
Propionate	Significant increase by >10% 0.01 > p-value > 0.001	NS	NS
Butyrate	Significant increase by >10% 0.01 > p-value > 0.001	Significant increase by >10% p-value < 0.0001	Significant increase by 5-10% p-value < 0.0001
Microbes	Significant increase by >10% 0.001 > p-value > 0.0001	NS	NS

Continued from page 19
with a live yeast product and with a yeast culture mixture at the same inclusion rates.

While Progut had positive effects on all of the studied rumen fermentation parameters the live yeast only had an effec on fermentation rate, total SCFA and butyrate production (Table 1).

The yeast culture mixture didn't enhance rumen fermentation in this trial.

Hannover Veterinary University tested the effect of Progut on rumen fermentation in comparison to less hydrolysed brewery yeast with continuous rumen simulation technique (Rusitec).

The addition of Progut with both inclusion rates tested, tended to increase the production of total SCFA, acetate and propionate (Fig. 2).

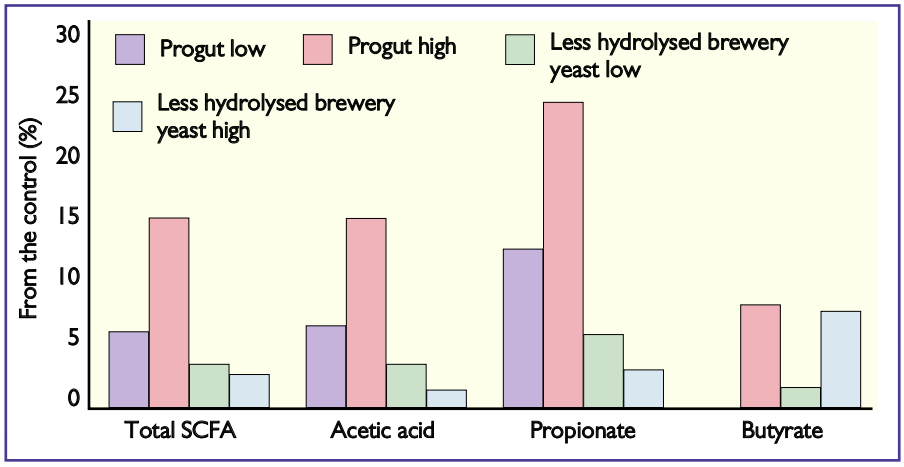

Fig. 2. The effects of Progut and less hydrolysed brewery yeast on in vitro rumen microbial metabolism (Hannover Veterinary University 2006).

The effect of the less hydrolysed yeast from the same raw material was negligible. This indicates that the degree of hydrolysis is important for the efficacy of this type of yeast in the rumen.

Rumen fermentation

To confirm the results from rumen simulation studies a trial with a fistulated cow was conducted. The cow received a basic compound feed at day 0, Progut at a level of 15g per day was mixed with the feed during the one week test period which was followed by a washout period (one week) without Progut addition.

According to the model fitted to the measured data ($p = 0.003^{**}$) the VFA concentration increased during the first four days of Progut feeding, then stabilised and started to decrease after the feeding of Progut was stopped (Fig. 3).

All the other rumen fermentation parameters measured, followed a similar pattern.

Effects on performance

The effects of Progut on the performance of dairy cows have been studied at the University of Helsinki and in farm trials in different countries.

Table 2. The effect of the diet on the milk productio

Weeks 1-8	Progut -
Milk (kg/d)	46.5
Fat (g/d)	1899
Protein (g/d)	1537
ECM (kg/d)	46.8
ECM/DMI	2.15

ECM = energy corrected milk yield, DM

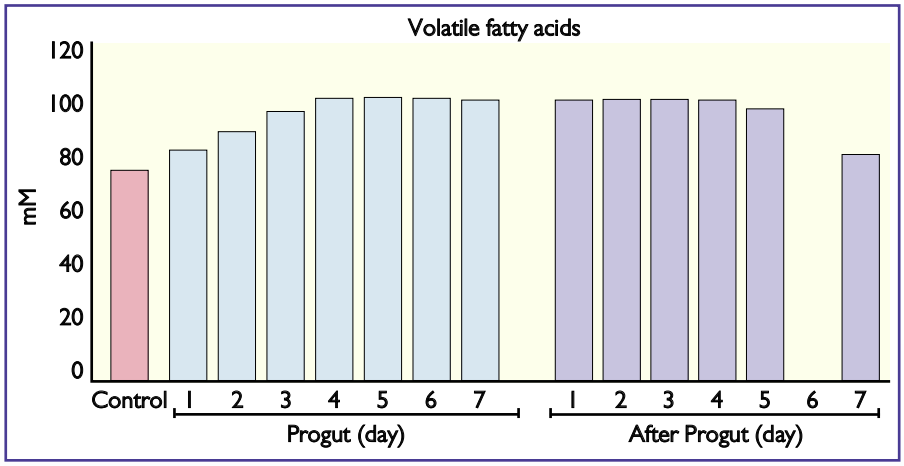

Fig. 3. The effect of Progut on the concentration of volatile fatty acids with a fistulated cow (Alimetrics Ltd 2006).

The trials have included early, mid and late lactation cows and the tested daily amounts of Progut have varied between eight and 20g.

In these trials Progut has increased the average daily milk yield by 1.5 to 3.4kg depending on the inclusion rate, lactation stage and time during which Progut was used. In the trial at the University of Helsinki a special energy supplement with or without Progut addition (20g) was fed to cows for two weeks pre- and eight weeks post-calving.

The addition of Progut in the diet increased the energy corrected milk yield (ECM) by 5.3% during the first eight weeks of lactation (Table 2). It also improved the feed efficiency calculated by ECM per DM intake.

Proposed mode of action

Yeasts have limited ability to grow in the rumen environment and are considered transient organisms.

Therefore, popular theories suggest yeast provides a special nutrient supply for rumen microbes.

However, the low inclusion rates of yeast products make this theory questionable. In nature yeast and microbes are in a competitive situation and it is possible that microbes in the rumen are sensing yeast or components of yeast as 'hostile strangers' and start to grow and activate to survive.

on of dairy cows (University of Helsinki).

	Progut +	Percentage
	47.3	
	2087	
	1541	
	49.3	5.3
	2.29	6.5

I = dry matter intake

A similar kind of signalling, known as 'quorum sensing', is well demonstrated between the microbes.

The patented production process of Progut breaks down the yeast cell wall to small particles, remarkably increasing the amount of soluble oligosaccharides.

This increases the amount of soluble yeast particles in the rumen and it can be assumed that there are much more 'hostile strangers' for rumen microbes than with a standard brewery yeast.

This theory can be supported by the trial at Hannover Veterinary University in which the effect of Progut on rumen fermentation was superior compared to less hydrolysed brewery yeast from the same raw material. ■